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ORIGINAL ARTICLE

RISK OF SLEEP APNEA SYNDROME AND AFFECTING FACTORS IN OBESE PATIENTS PRESENTING AT THE FAMILY MEDICINE OUTPATIENT CLINIC

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ABSTRACT

Aim: Obstructive sleep apnea syndrome (OSAS) is a significant health problem that is frequently seen in obese individuals, and affects the quality of life of these individuals. In this study, we aimed to investigate the risk of obstructive sleep apnea syndrome and the affecting factors in obese individuals.

Methods: Our study was cross-sectional. A total of 318 patients who presented at the Family Medicine Polyclinic between 01.07.2020 and 31.12.2020 were included. The patients were seen in the outpatient clinic by the investigator, their sociodemographic data was obtained, and their measurements were made. OSAS risks were calculated according to the updated STOP-Bang questionnaire of the participants.

Results: The median body mass index (BMI) of the patients included in our study was 39.3 (30.1-64.2) kg/m2; 93 (29.2%) were mildly obese, 92 (28.9%) were moderately obese, 117 (36.8%) were morbidly obese, and 16 (5.0%) were super obese. According to the updated STOP-Bang questionnaire, 107 (33.6%) participants had a low risk of OSAS, 39 (12.3%) a moderate risk of OSAS, and 172 (54.1%) a high risk of OSAS. When the effects of age and gender were controlled, it was found that one unit increase in BMI values significantly increased the risk of OSAS by 1.10 times.

Conclusions: The use of the updated STOP-Bang questionnaire was found to facilitate the determination of the risk of OSAS in obese individuals in this study.

Keywords: Obesity, Obstructive sleep apnea syndrome, Body mass index, STOP-Bang Questionnaire

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INTRODUCTION

Obesity is a chronic disease that can be defined as an increase in adipose tissue with negative consequences due to an increase in energy intake or a decrease in energy expenditure [1]. Obesity plays a role in the pathogenesis of various diseases by affecting many organ systems [2]. The metabolic syndrome, prediabetes, diabetes mellitus (DM), dyslipidemia, hypertension (HT), cardiovascular disease (CVD), osteoarthritis, and obstructive sleep apnea syndrome (OSAS) are frequently seen in obese patients [3]. The respiratory system is one of the systems most commonly affected by obesity. Obesity is one of the most significant modifiable risk factors for respiratory system diseases such as the obesity hypoventilation syndrome (OHS), OSAS, asthma, pneumonia, and pulmonary embolism [4].

Obstructive sleep apnea is a syndrome that causes hypoxia, in which there are recurrent episodes of complete or partial obstruction of the upper airways during sleep. OSAS is the most common type of sleep breathing disorder in the population and is directly related to mortality as it is associated with various diseases such as coronary heart disease, DM, stroke, arrhythmia, heart failure, and HT. Obesity, advanced age, male gender, smoking, and alcohol and substance use are risk factors for OSAS. The OSAS risk is increases 8-12 times in obese patients [5]. Obesity causes OSAS, and OSAS creates a dangerous cycle by causing obesity [3].

The first thing to do for the diagnosis of OSAS is to take anamnesis from the patients and their relatives. The presence of symptoms such as snoring and excessive daytime sleepiness, and witnessed apnea should be considered to indicate OSAS [6]. There are also easy, guiding, and diagnosis-enhancing questionnaire studies that can be applied during the anamnesis. The updated STOP-Bang questionnaire contains 8 questions to evaluate the risk of OSAS with parameters such as snoring, excessive daytime sleepiness, apnea, HT, BMI, age, neck circumference, and gender. Many studies have shown this questionnaire to be promising in determining the risk of OSAS [7]. The gold standard method in the diagnosis of OSAS is polysomnography (PSG). The first step in the treatment is to treat obesity, which is the most important modifiable risk factor [8].

Obstructive sleep apnea is a syndrome that affects the quality of patient's life. Therefore, determining the risk of OSAS in obese patients, who are frequently followed in primary health care services, is very important for preventive and curative medicine in primary care [9]. In this study, we aimed to analyze the risk of sleep apnea syndrome and the affecting factors by administering the updated STOP-Bang questionnaire to obese patients.

Methods

A total of 318 patients who applied to Family Medicine Polyclinic between 01.07.2020 and 31.12.2020, who were 18 years of age and older, had a BMI ≥30 kg/m2 and accepted to participate

in the study, were included in the study. Patients with known chronic hypoxia-causing diseases such as COPD, asthma or congestive heart failure, pregnant women, those living alone, and patients with a previous diagnosis of OSAS were not included in study.

The participants were evaluated by the investigator, and their anamnesis was taken. Physical examinations were made and the height, weight, waist circumference, and neck circumference measurement and bioelectrical impedance analysis were performed. The waist and neck circumferences of the patients were measured in centimeters by placing the tape measure over the umbilicus and at the level of the Adam's apple. Measurements were made by the same person for each patient. After the patients' height and weight measurements, BMI was calculated with the formula of "body weight (kg)/ height squared (m2)". Patients with a BMI of 30-34.99 kg/m2 are classified as slightly obese, those with a BMI of 35-39.99 kg/m2 as moderately obese, those with a BMI of 40-49.99 kg/m2 as morbidly obese, and those with a BMI of ≥50 kg/m2 as super obese [3]. Body analyses of patients were performed on an empty stomach and with bare feet using the MC-580 Tanita device. OSAS risks were calculated with the updated STOP-Bang questionnaire and variables such as snoring, daytime sleepiness, witnessed apnea, hypertension, BMI, age, neck circumference, and gender were evaluated and the patients divided into three subgroups as those with a low, moderate, and high risk of OSAS. If the answer to 0-2 questions was yes, a low risk of OSAS was determined, and answering yes to 3-4 questions indicated a moderate risk of OSAS is calculated. If the answer to 5-8 questions or 2 or more of 4 STOP questions was yes + male gender; or yes to 2 or more of 4 STOP questions + BMI > 35 kg/m2; or yes to 2 or more of 4 STOP questions + large neck circumference (43 cm in males, 41 cm in females) this was defined as a high risk of OSAS [10].

Ethics committee approval dated 11.06.2020 and numbered 2020/514/179/39 was received from the ethics committee of Kartal Dr. Lütfi Kırdar City Hospital.

Study data were analyzed in the SPSS 17.0 package program. Descriptive criteria (frequency, percentage, mean, median, standard deviation, and minimum-maximum values) were used in the analyses. The Mann-Whitney U, Kruskal-Wallis and Spearman Correlation tests for abnormally distributed variables were used. Categorical variables were evaluated with the chi-square test. P values <0.05 were considered significant in all analyses.

Results

A total of 318 patients were included in our study, of which 257 (80.8%) were female and 61 (19.2%) were male. The sociodemographic data of the patients are summarized in Table 1. When the chronic diseases of the participants were evaluated, 59 (18.6%) of the patients had hypothyroidism, 110 (34.6%) had DM, 107 (33.6%) had HT, 35 (11.0%) had hyperlipidemia,

11 (3.5%) had CVD, and 35 (11.0%) had gastroesophageal reflux disease. It was observed that 28 (8.8%) of the participants had a history of bariatric surgery. As a result of the anthropometric measurements of the patients, the median height was 162.0 (143.0-195.0) cm, the median weight was 102.2 (65.0-177.2) kg, the median waist circumference was 119.0 (81.0-183.0) cm, the median neck circumference was 38.5 (33.0-45.5) cm, the median body fat percentage was 41.0% (19.0-57.0), and the median BMI was 39.3 (30.1-64.2) kg/m2. There were 93 (29.2%) mildly obese, 92 (28.9%) moderately obese, 117 (36.8%) morbidly obese, and 16 (5.0%) super obese subjects.

Table1.Sociodemographic characteristics of the participants

	n(%)	**Mean±SD**
Age(years)	318(100.0)	43.9±12.9
	n	**%**
Gender		
Female	257	80.8
Male	61	19.2
Educational level		
Illiterate	11	3.4
Primaryschoolgraduate	132	41.5
Secondaryschoolgraduate	42	13.2
Highschoolgraduate	80	25.2
Universitygraduate	53	16.7
Maritalstatus		
Married	238	74.8
Single	80	25.2
WorkingStatus		
Worker	108	34.0
UnemployedandRetired	196	61.6
Student	14	4.4

Incomerate		
Minimumwageand below	56	17.6
Twicethe minimum wage	190	59.8
Threetimestheminimumwage	72	22.6
Useof smoking		
Yes	90	28.3
Quit smoking	45	14.2
No	183	57.5
Useofalcohol		
Yes/Quitofalcohol	36	11.3
No	282	88.7

According to the updated STOP-Bang questionnaire, three subgroups were found; 107 (33.6%) of the participants had a low risk, 39 (12.3%) a moderate risk of OSAS, and 172 (54.1%) a high risk of OSAS. When all patients included in the study were evaluated, a statistically significant correlation was found between BMI and updated STOP-Bang risk scores (p=0.000). When the updated STOP-Bang risk scoring subgroups were evaluated by BMI, no statistically significant difference was found between the low risk group and the moderate risk group, while the difference was significant between the moderate risk group and the high risk group, and also the low risk group and the high risk group (respectively p=1.000, p=0.000 and p=0.000).

When the STOP-Bang risk scoring subgroups of the participants were analyzed according to the obesity subgroups, 54 (58.1%) of the mildly obese patients had a low OSAS risk, 23 (24.7%) moderate OSAS risk, and 16 (17.2%) a high risk of OSAS. Of the patients in the moderately obese group, 30 (32.6%) had a low risk of OSAS, 5 (5.4%) had moderate risk, and 57 (62.0%) had high risk. Of the patients in the morbidly obese group 23 (19.7%) had a low risk of OSAS, 10 (8.5%) had moderate risk, and 84 (71.8%) had high risk. A moderate risk of OSAS was found in 1 (6.3%) patient in the super obese group, and a high risk of OSAS was found in 15 (93.8%) patients.

When the patients included in the study were evaluated by dividing them into obesity subgroups, a statistically significant relationship

was found between BMI and the OSAS risk of the patients in the mildly obese group and morbidly obese group, while no statistically significant difference was found between BMI and the OSAS risk of the patients in the moderately obese group and super obese group (p=0.033, p=0.035, p=0.695, and p=0.103, respectively). The relationships between BMI and the OSAS risk of the patients in the study are shown in Table 2. In the sub-analyses examining the relationship between BMI and the OSAS risk of the patients in the mildly and morbidly obese groups, it was found that the difference was between the low OSAS and high OSAS risk groups (p=0.049 and p=0.025, respectively).

Table 2: Association between participants' BMI and OSAS risks.

	p-value
Mildlyobese Low risk of OSAS Moderate risk of OSAS High risk of OSAS	**0.033***
Moderate lyobese Low risk of OSAS Moderate risk of OSAS High risk of OSAS	0.695
Morbidlyobese Low risk of OSAS Moderate risk of OSAS High risk of OSAS	**0.035***
Superobese Moderate risk of OSAS High risk of OSAS	0.103

* Mann-Whitney U and Kruskal-Wallis tests were performed. BMI: Body Mass Index; OSAS: ObstructiveSleepApneaSyndrome

A statistically significant difference was found between the updated STOP-Bang risk scores of the participants and their age and gender (p=0.000 and p=0.000, respectively). A statistically significant difference was found between the updated STOP-Bang risk scores of the participants and their weight, body fat percentage, waist circumference and neck circumference (p=0.000, p=0.000, p=0.000, and p=0.000, respectively).The Multivariate Binary Logistic Regression Analysis found that increasing age decreased the risk of OSAS (OR=0.954, p=0.001). In addition, it was found that one unit increase in BMI value increased the risk of OSAS by 1.10 times (p = 0.001) (Table 3).

Table 3. Effectiveness of age, gender and BMI in increasing the risk of OSAS

	B	SE	Wald	df	p- value	OR	95% CI	
							LL	UL
Age	-0.047	0.014	10.650	1	0.001	0.954	0.928	0.981
Gender(Man)	0.934	0.583	2.563	1	0.109	2.544	0.811	7.976
BMI	0.095	0.028	11.431	1	0.001	1.100	1.041	1.163

NR2=0.15, X2=25.14, p<0.001, Multivariate Binary Logistic Regression Analysis.

BMI: Body Mass Index; OSAS: ObstructiveSleepApneaSyndrome; OR: Odds Ratio; LL: Lower Limit; UL: Upper Limit

Discussion

A literature review reveals limited studies on obese individuals and the relationship between the updated STOP-Bang risk score and BMI. In our study, a statistically significant correlation was found between BMI and the updated STOP-Bang risk scores. A statistically significant difference was also found between the updated STOP-Bang risk scores of the participants and their age, gender, and weight.

In the study of Mergen et al. on OSAS screening in 217 obese patients, 59 (27.2%) of the patients were female and 158 (72.8%) were male. The mean BMI of the patients included in the study was 35.9±4 kg/m2, and the mean neck circumference was 43.1±3 cm. They evaluated the patients with the updated STOP-Bang questionnaire; and they did not find a statistically significant relationship between BMI and the updated STOP-Bang risk scores of the participants. Based on the updated STOP-Bang questionnaire, 206 (95%) participants were at high risk of OSAS [11]. In study performed by Öztürk et al. on 185 patients aged 18 years and older, who presented at the sleep disorders clinic and who had not previously been diagnosed with OSAS, the mean BMI of the patients was 35.5±11 kg/ m2 and the male sex ratio was found to be 65.4%. A statistically significant correlation has been shown between the updated STOP-Bang risk scores and BMI of patients [12]. In study by Chung et al. where 7013 preoperative patients were scanned, successful polysomnography and STOP- Bang questionnaire administration were performed in 667 patients and the mean BMI of the 310 patients was ≥30 kg/m2. In the study, the sensitivity and specificity of the STOP-Bang questionnaire was investigated in OSAS in cases with BMI ≥30 kg/m2 and cases with BMI ≥35 kg/m2. Of the 310 obese patients, 184 (59%) were female and 126 (41%) were male. The mean BMI was 35.7±5 kg/m2 and the mean neck circumference was 39.8±4 cm. The BMI of 140 patients was ≥35 kg/m2. In cases with BMI ≥30 kg/m2 and ≥35 kg/m2, the STOP-Bang questionnaire scores were considered to be successful in predicting moderate and severe obstructive sleep apnea [13].

In the study conducted by Ursavaş et al. on 119 cases diagnosed with OSAS, 88.2% of the participants were male and 40.5% had BMI ≥30 kg/m2. They grouped the participants as mild, moderate and severe based on the Apnea Hypopnea Index (AHI), and no statistically significant difference was found between these groups in age, gender, and BMI [14]. In the study of Vasu et al. in which 135 cases were included to evaluate OSAS and postoperative complications with the STOP- Bang questionnaire, 25.2% of the cases were found to have BMI ≥30 kg/m2 and 70.6% of these cases were found to have a high risk of OSAS [15]. In the evaluation of the STOP-Bang questionnaire administered by Vasu et al., the risk of OSAS was calculated in two groups as low and high, while in our study, the risk of OSAS was grouped as low, medium, and high. From this point of view, the total of the moderate and high OSAS risk groups in our study is similar to the high OSAS risk group in the study of Vasu et al.

The STOP-Bang questionnaire was administered to 75 patients with a BMI ≥35, without a previous diagnosis of OSAS for difficult airway estimation in obese patients in the study of Toshniwal et al. A low risk of OSAS was found in 32% of these patients and high risk of OSAS in 68%. In the same study, the BMI of 42 participants with OSAS was found to be significantly higher than the BMI of 24 participants with a low risk of OSAS [16]. Alhouqani et al. have evaluated the participants with polysomnography and the STOP-Bang questionnaire in their study, in which they included 193 Arabic-speaking, 18-year-old and older patients who were not diagnosed with obstructive sleep apnea previously, who presented at the sleep disorders clinic. In the study, the mean BMI of the patients was 34.90±8.6 kg/m2and the male gender ratio was 77.7%. When participants with BMI ≥35 kg/m2 were evaluated based on the STOP-Bang questionnaire, 27% were found to have a high risk of OSAS, and when evaluated according to PSG, 24% were classified as moderate to severe OSAS [17].

In Kayabekir's study with 300 patients aged 60 years and older with complaints of sleep-disordered breathing, 21.3% of the participants were overweight, 53.7% were obese, and 17.7% were morbidly obese. It was determined that 59.6% of the obese participants had severe OSAS, and 26.5% of the morbidly obese participants had severe OSAS. In this study, it was observed that the prevalence of obesity was high in older people with complaints of sleep-disordered breathing [18]. Ersoy et al. studied the relationship of OSAS with obesity and comorbidities, with 682 participants, they found that the risk of OSAS was higher in men, overweight and obese, individuals aged 50 and over, and individuals with more than two comorbidities. In their studies, it was observed that each unit increase in BMI increased the OSAS risk score by one unit [19].

In the study of Huh et al. included 7650 Koreans over the age of 40, they investigated the prevalence and associated factors of high-risk obstructive sleep apnea as defined by STOP-Bang questionnaire. In analysis, obesity was associated

with high risk of OSAS and based on STOP-Bang questionnaire 12% of participants were at high risk of OSAS [20].

Limitations of the Study

The low number and rate of male patients in our study is one of the main limitations of our study. Patients included in the study were all obese, and the fact that known OSAS, asthma, and COPD cases were not included in the study is a limitation of our study. In order to prove the reliability of the use of the updated STOP-Bang questionnaire in determining the risk of OSAS, it is thought that different studies should be conducted in larger samples, including both obese and non-obese individuals with equal male and female sex ratios.

Based on our results, this study shows that the use of the updated STOP-Bang questionnaire to determine the risk of OSAS is convenient. It is thought that OSAS and obesity treatment will be performed more effectively by determining the risk of OSAS, referring high-risk patients to clinics with sleep laboratories and evaluating them in terms of an OSAS diagnosis with PSG, while they continue to monitor obesity.

Conflicts of interest: The authors have nothing to disclose.

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